

NRC STAFF RESOLUTION OF PUBLIC COMMENTS

REGARDING PROPOSED GENERIC LETTER, “MANAGING
GAS INTRUSION IN EMERGENCY CORE COOLING, DECAY
HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS”

Enclosure 2

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GENERIC LETTER, "MANAGING GAS INTRUSION IN EMERGENCY CORE
COOLING, DECAY HEAT REMOVAL, AND CONTAINMENT SPRAY SYSTEMS"
(72 FR 29010, DATED MAY 23, 2007)

Table 1. Sources of Comments

Comment Designator	Reference	ADAMS ccession No.
BWR	Bunt, Randy, "Comments on Proposed Generic Letter, Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems," Letter to USNRC from BWROG Chair, BWROG-07039, July 23, 2007.	ML072060068
Duke	Harrall, Thomas P., Jr., "Comments on Proposed Generic Communication; Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems Published in the <i>Federal Register</i> (72 FR 29010) on May 23, 2007," Letter to USNRC from Vice President, Duke Energy, July 23, 2007.	ML072080348
Exelon	Helker, D. P., "Comments on Proposed Generic Letter, 'Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Systems' (72FR29010, dated May 23, 2007)," Letter to USNRC from Manager - Licensing, Exelon/AmerGen, July 26, 2007.	ML072190101
NEI	James H. Riley, "Comments on Proposed Generic Letter: Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems," Letter to USNRC from Director, Engineering, Nuclear Energy Institute (NEI), July 23, 2007.	ML072080345
PWR	Schiffley, Frederick P. "Ted" II, "Comments to Draft Generic Letter 'Managing Gas Intrusion in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems' (PA-SEE-0365), Letter to USNRC from Chairman, PWR Owners Group, July 23, 2007.	ML072060362
STARS	Moser, T., "Strategic Teaming and Resource Sharing (STARS) Comments of Proposed Generic Letter, 72FR29010 (May 23, 2007)," Letter to USNRC from Chairman, STARS Integrated Regulatory Affairs Group, August 3, 2007 (Received by NRC August 10, 2007).	ML072250284
TVA	Wetzel, Beth A., "Comments ON Proposed Generic Communication CONCERNING Managing gas intrusion (Vol. 72 FR 29010-29015)," Letter to USNRC from Manager, Corporate Licensing and Industry Affairs, Tennessee Valley Authority, July 23, 2007.	ML072080346

Comments and Comment Resolution

Several commenters requested a more precise description of the required response. In evaluating the comments, the NRC staff concluded that use of “accumulation” in describing gas issues was a more precise term than use of “intrusion” since the concern is accumulation of sufficient gas to impact operability.

The generic letter (GL) title and contents have been changed accordingly. To further provide a more precise description, the NRC staff has reorganized part of the **DESCRIPTION** section of the GL and has made editorial changes to better articulate the concerns and has modified the **REQUESTED ACTIONS**, **REQUESTED INFORMATION**, and **REQUIRED RESPONSE** sections to more precisely describe the response requirements. In making these changes, and in recognition of the studies identified by the PWR Owners Group that are listed under **PWR General Comment** and the schedule comments in **Duke Comment 4** and **PWR Comment 1**, below, the NRC staff concluded that the response time identified in draft GL should be modified. Therefore, the 6 month **REQUIRED RESPONSE** section has been replaced by the following:

In accordance with 10 CFR 50.54(f), an addressee must respond as described below.

Within 9 months of the date of this GL, each addressee is requested to submit a written response consistent with the requested actions and information. If an addressee cannot meet the requested response date, the addressee shall provide a response within 3 months of the date of this GL and is requested to describe the alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

Furthermore, the **REQUESTED ACTIONS** section has been revised as follows:

The NRC requests that each addressee evaluate its ECCS, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

and the **REQUESTED INFORMATION** section has been revised as follows:

The NRC requests that each addressee provide the following information: (a) A description of the results of evaluations that were performed pursuant to the above requested actions. This description should provide sufficient information to demonstrate that you are or will be in compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; (b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that you determined were necessary to assure compliance with these regulations; and, (c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

Several commenters requested additional detail similar to or in addition to information provided in the NRC memorandum referenced in the draft GL, “Technical Considerations for Reasonably Assuring Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems Operability,” ML072190151. To consolidate the information in one location, the information provided in the memorandum is now contained in an enclosure to the GL. Some of the details that were in the body of the GL have also been moved to the new GL enclosure.

In the following list, each comment is identified by the Table 1 “Comment Designator” and is addressed below.

BWR Comment

“The proposed generic letter puts forth a view that, since some licensees have not met requirements, all licensees must now provide a substantial amount of information to demonstrate compliance. This information would then be reviewed by NRC to ‘determine if additional regulatory action is required.’ As noted in the proposed generic letter there is ample regulation applicable to gas management. Our overall sense of the operating experience cited in the letter is that this information alone is not sufficient to validate that a generic issue exists. Proper venting in BWR systems is satisfied by plant design features, programs, and analyses including: keep fill systems with alarms, operator rounds, routine venting, periodic flow testing, fill and venting procedures and hydrogen accumulation studies.

“Licensees are responsible for assuring compliance with NRC regulations and technical specifications. In our view, any questions regarding the status of licensee compliance with NRC regulations could better be addressed using the existing inspection and oversight processes, including the use of NRC Inspection Manual Temporary Instructions (TIs).

“The initial cost for assembly of information is minimal, but the evaluation costs of the information submitted by the licensees will be large. Resolving follow-up questions and developing actions would require extensive manpower resources. An additional burden for the US nuclear utilities will be the NRC cost recovery for the review of the information. Resources, which at this time cannot be quantified, will be required of licensees to defend against potential allegations of non-compliance (implied in the proposed generic letter) or to implement new programs or procedures to meet some new standard of documentation.

“Since the proposed generic letter does not demonstrate a generic problem of high safety significance exists, the BWROG suggests that, rather than issuing a proposed generic letter, NRC management address the issue via existing processes at the disposal of the NRC.”

NRC Staff Response to BWR Comment

The NRC staff has categorized the BWR letter as providing five comments. Each is listed and addressed below:

BWR Comment 1

The proposed GL puts forth a view that, since some licensees have not met requirements, all licensees must now provide a substantial amount of information to demonstrate compliance.

BWR Comment 2

The information cited in the GL is not sufficient to validate that a generic issue exists. Since the proposed GL does not demonstrate that a generic problem of high safety significance exists, the BWROG suggests that, rather than issuing a proposed GL, NRC management address the issue via existing processes at the disposal of the NRC.

BWR Comment 3

Proper venting in BWR systems is satisfied by plant design features, programs, and analyses including: keep fill systems with alarms, operator rounds, routine venting, periodic flow testing, fill and venting procedures, and hydrogen accumulation studies.

NRC Staff Response to BWR Comments 1-3

The NRC staff provided a few examples of past events in the draft GL to illustrate the generic nature of the issues and the need for the GL. In light of the BWR comments, the following example has been added to the draft GL:

On June 4, 2003, Quad Cities operators performed a monthly TS surveillance to demonstrate that the 1B core spray pump discharge piping was full of water. The piping was vented for 12 minutes before water flow was observed and the NRC inspectors determined that the licensee had failed to provide a correct venting procedure that would ensure continued pump operability. The system engineer estimated that the piping was about one-half empty. A water hammer with the potential to cause damage would have occurred if the core spray pump had been started and the core spray system was determined to be inoperable in the as-found condition. The NRC inspectors also determined that the emergency core cooling system (ECCS) surveillance procedures were incorrect, that licensee review in response to the excess gas was inadequate, and that TS 3.0.4 had been violated. This was considered to be a licensee-identified violation, the finding was greater than minor because of the pump inoperability, and the finding was considered to be of very low safety significance because it did not result in an actual loss of function. It was dispositioned as a noncited violation and entered into the corrective action program (NRC Inspection Report 50-254/03-05, 50-265/03-05, July 17, 2003, ADAMS Accession No. ML031980621).

BWR Comment 4

Licensees are responsible for assuring compliance with NRC regulations and TSs. Questions regarding the status of licensee compliance with NRC regulations could better be addressed using the existing inspection and oversight processes, including the use of NRC Inspection Manual Temporary Instructions (TIs).

BWR Comment 5

The evaluation costs of the information submitted by the licensees will be large. Resolving follow-up questions and developing actions would require extensive manpower resources. An

additional burden for the US nuclear utilities will be the NRC cost recovery for the review of the information. Resources, which at this time cannot be quantified, will be required of licensees to defend against potential allegations of non-compliance (implied in the proposed generic letter) or to implement new programs or procedures to meet some new standard of documentation.

NRC Staff Response to BWR Comments 1-5

It is the NRC staff's intent to minimize the burden associated with resolution of the gas issues discussed in the draft GL. However, the staff's overriding consideration is the safety concern that gas in safety systems can result in degradation or failure of those systems to perform their intended safety functions. Information cited and referenced in the GL demonstrates that gas events have been widespread and of a continuing nature despite existing processes. Furthermore, industry assessments, NRC inspections, and NRC staff reviews have clearly established the susceptibility of all plant designs to these issues. Therefore, the staff believes that use of the GL process is appropriate.

NRC Staff General Response to BWR Comments

The BWR comments appear to reflect a misunderstanding of the need for the GL and the detail provided in the draft GL. In response, the information provided in the NRC memorandum (ML072190151) that was referenced in the draft GL, as well as some details in the draft GL, have been moved to a new GL enclosure.

Duke Comment 1

"In the DISCUSSION section, page 10, the GL suggests that a TS surveillance should address operability prior to the surveillance and during the interval until the next surveillance. (See DISCUSSION section, page 10). SSCs (structures, systems, and components) are typically presumed operable when a surveillance is current and acceptance criteria are met and documented. This would be an appropriate consideration for establishing the SR (surveillance requirement) frequency and may be a valid expectation for a TS SR basis document. However, once established, the principle of presumed operability between surveillances should not be challenged."

NRC Staff Response to Duke Comment 1

This comment applies to the end of the first paragraph in the draft GL DISCUSSION section which states:

Additional issues include TSs, which often do not require venting of suction piping despite voids in suction pipes generally being of more concern than in discharge piping, and do not adequately address operability of the subject systems prior to surveillance and for the time span until the next surveillance. This GL and the anticipated NRC followup to this GL are intended to correct such conditions.

The NRC staff's intent was to identify that existing SRs often result in venting an unquantified gas quantity that may have been sufficient to cause an inoperable condition prior to venting and

that gas accumulation at the existing rate may result in inoperability prior to the next SR. This is inconsistent with the intent of SRs which, as implied by **Duke Comment 1**, is to provide assurance that the subject system was operable when the surveillance was initiated and is expected to remain operable until the next surveillance. In response to **Duke Comment 1**, in addition to responding to other commenters, the **DISCUSSION** Section has been reorganized to improve clarity and information detail has been moved to the GL enclosure. This should address **Duke Comment 1**.

Duke Comment 2

“In the DISCUSSION section, page 11, discussion of pump cavitation should be removed from the document entirely. Cavitation is not relevant to gas intrusion. It is, by definition, the formation and subsequent collapsing of vapor bubbles in a flow stream. Moreover, it is strictly a design issue. Cavitation potential is a function of system geometry, flow rates, pressure, and fluid temperatures. Venting and surveillances for system voids, which are entirely appropriate for gas intrusion, will have no bearing on the potential for cavitation.”

NRC Staff Response to Duke Comment 2

The Duke comment is with respect to the following draft GL statement:

- (4) Pump cavitation caused by entrained gas results in additional stresses that can lead to premature failure of pump components that can render the pump inoperable.

The GL statement has been rewritten as follows:

- (4) Unbalanced loads due to entrained gas and the reduction in inlet pressure at a pump due to gas in a vertical suction line that causes pump cavitation can result in additional stresses that lead to premature failure of pump components.

Duke Comment 3

“If a licensee has no TS SR requirement and no established design criterion (calculated limit on gas quantity) by which to establish acceptance criteria, does the GL require or expect that the limit be determined and surveillance be implemented in the interim while a TS change is processed?”

NRC Staff Response to Duke Comment 3

The NRC staff notes the draft GL provides information that addressees may consider when responding to the GL request for information. A GL does not provide new requirements although it may reference existing requirements. In response to the Duke question, each addressee is expected to meet the regulatory requirements summarized in the GL in accordance with its plant's licensing basis. Furthermore, a sample history of staff inspections relative to the regulatory requirements was provided to illustrate the staff concerns. Although the NRC staff has not planned interim inspections on the GL topics, any routine inspections,

inspections in response to events, or inspections in response to discovery of inoperable systems may include consideration of the information provided in the GL. This is consistent with past NRC practice where topics identified in the GL have been assessed during inspections.

Duke Comment 4

“Input from pump vendors will probably be required to determine acceptable limits for entrained gas volumes. Implementation schedules will need to reflect this factor.”

NRC Staff Response to Duke Comment 4

The NRC staff agrees and the draft GL has been modified as discussed in the first paragraph, above. In regard to this topic, the NRC staff will expect that substantiating data will be available to support vendor claims.

Duke Comment 5

“In the DISCUSSION section, page 14, the proposed GL states, ‘the NRC staff will consider justification for not conducting a periodic surveillance or for extending the time between surveillances of certain sections of piping if an addressee considers surveillance to be unnecessary.’ The GL in a subsequent sentence on the same page states, ‘An assessment for such plants that (1) acceptably eliminates other means of introducing gas, (2) establishes acceptable verification that the lines are essentially full following a condition that reduces the discharge line pressure, and (3) establishes an operating history confirming that gas has not accumulated will be adequate justification for not conducting surveillances inside containment or at locations that constitute a hazard to personnel performing the assessment.’ With proper justification by the utility, this specific exemption from surveillance should apply regardless of the physical location.”

NRC Staff Response to Duke Comment 5

The NRC staff agrees. The draft GL has been rewritten as discussed in **NRC Staff Response to PWR Comment 14** with additional discussion in **NRC Staff Response to PWR Comment 13**.

Duke Comment 6

“Venting may release explosive gas mixtures as a result of supersaturated hydrogenated fluid in the primary systems. Accordingly, personnel safety issues may be raised as a result of the new venting requirements. The gas may not necessarily be in the form of a pocket within the piping system but rather may simply release from the fluid when exposed (vented) to atmospheric conditions.”

NRC Staff Response to Duke Comment 6

As previously stated, the GL does not provide new requirements although new requirements may result during resolution of issues identified in the GL and the GL Enclosure. The potential

for hydrogen is identified at the end of the GL Enclosure and the NRC staff concluded this was sufficient to address **Duke Comment 6**.

Exelon Comment

"Exelon/AmerGen support the comments submitted by the Nuclear Energy Institute (NEI) on behalf of the industry in its letter dated July 23, 2007."

NRC Staff Response to Exelon Comment

See NRC staff responses to NEI comments, below.

NEI Comment 1

"An industry review of the proposed generic letter was conducted and it has been determined that while the proposed Requested Actions may address ECCS gas intrusion, the proposed text could be misinterpreted. The intent of the Requested Actions to confirm system operability is acceptable; however, the choice of words ("minimized" and "monitored") could lead to unreasonable interpretations in light of the examples provided within the Discussion section of the proposed generic letter. Generally "minimized" means striving to the absolute minimum amount; this is not necessary. Likewise "monitored" could imply continuously recording; this is beyond the frequency necessary to confirm operability."

NRC Staff Response to NEI Comment 1

The REQUESTED ACTIONS statement has been rewritten as described in the **NRC Staff Response to NEI Comments 1 and 4**, below. The words "minimized" and "monitored" are no longer used.

NEI Comment 2

"The proposed generic letter implies in some areas that the piping in the subject systems must be "full of water" and air intrusion must be "precluded" to satisfy the systems design basis. The Discussion section, page 13, item (2) implies that the accumulation of gas is an unacceptable condition; however, the Technical Specification bases for the referenced Surveillance Requirements from the BWR 6 Standard Technical Specification (NUREG 1434) states:

'The 31 day Frequency is based on operating experience, on the procedural controls governing system operation, and on the gradual nature of void buildup in the ECCS piping.'

Similar words are in each standard Technical Specifications. This recognizes that some accumulation of gas is expected. Since systems are capable of accepting some amount of gas with negligible effect on their function, use of the absolute limits implied are unnecessary and may not be possible to achieve. The ability of a piping and pumping system to pass some gas acceptably can be a function of the specifics of a plant's pump and piping system; therefore, the system's ability can be open to interpretation."

NRC Staff Response to NEI Comment 2

The rewritten **DISCUSSION** Section of the GL is intended to address **NEI Comment 2**.

NEI Comment 3

“Also, in the Discussion section, it appears that the Staff is expecting that every venting performed by the plant needs to be documented even when the venting is preventive in nature. The quantity of gas vented could be difficult to quantify and may not be of much value in most cases. As discussed in the proposed generic letter and the NRC memorandum referenced on page 15, (Technical Considerations for Reasonably Assuring Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems Operability, ML071030382, April 17, 2007), the measurement of air volume is not straightforward and the affect of air in the system is uncertain. Periodic venting that results in gas in amounts that do not affect the operability of the system should only be tracked for trending purposes not established as absolute limits or repeatedly minimized.”

NRC Staff Response to NEI Comment 3

The **DISCUSSION** Section of the GL has been rewritten as follows:

(3) **Testing.** Criteria V and XI of Appendix B to 10 CFR Part 50 and the operating license require licensees to perform testing using written test procedures that incorporate the requirements and acceptance limits contained in applicable design and licensing documents and Criterion XVII requires appropriate records. Testing of portions of piping and components in the subject systems where unacceptable gas accumulation may occur is necessary to confirm acceptance limits and operability unless it has been acceptability established that some portions may be excluded. Surveillance and testing that do not ensure operability prior to the next surveillance are not consistent with this testing requirement. In practice it is not uncommon for licensees to vent gas during periodic surveillances and then conclude that the subject systems were and are operable without addressing the pre-venting condition. This practice does not meet operability requirements

NEI Comment 4

“We suggest that the Requested Action section be re-written to be more precise and the Discussion section be revised to be consistent with the above comments. Thus, the proposed generic letter would ask licensees to confirm that gas intrusion is maintained less than the amount that challenges operability and that it is validated, as necessary, to confirm operability.”

NRC Staff Response to NEI Comments 1 and 4

The NRC staff has rewritten the **DISCUSSION** Section to include the Licensing Basis, Design, Testing, and Corrective Actions as principal concerns. The **REQUESTED ACTIONS** statement has been rewritten as follows:

The NRC requests that each addressee evaluate its ECCS, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

Furthermore, the **REQUESTED INFORMATION** Section has been rewritten to be consistent with the **REQUESTED ACTIONS**:

The NRC requests that each addressee provide the following information: (a) A description of the results of evaluations that were performed pursuant to the above requested actions. This description should provide sufficient information to demonstrate that you are or will be in compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; (b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that you determined were necessary to assure compliance with these regulations; and, (c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

PWR General Comment

“The PWROG agrees that the subject systems need to be maintained ‘sufficiently full of water’ to ensure operability, as opposed to ‘full of water.’ Maintaining the subject systems sufficiently ‘full of water’ acknowledges that gas intrusion in the subject systems does not necessarily render the system(s) inoperable. The amount and location of the gas are important in determining whether the system(s) are inoperable. In order to develop realistic criteria to determine the amount of gas that could impact operability, several studies need to be completed, such as:

- Characterizations of the sources and rate of generation of gases in systems
- Ingestion of gas from tanks and recirculation sumps (vortexing)
- Characterization of gas transport in the subject system piping as a function of system flow requirements
- Allowable limits on the ingested gas volume for pump suction piping for assessing pump operability, as well as for the pump discharge piping to alleviate water hammer (slamming check valves or water cannon effect on the piping)
- Allowable limits on ingested gas volume in pump suction piping to ensure pump operability
- Allowable limits on ingested gas volume to mitigate dynamic pressure pulsation
- Development of guidance on the sequence of venting to prevent void formation in high points remote from the vent location
- Identification of those portions of systems in which venting is unnecessary (e.g., downstream of the CS spray isolation valve to the spray headers).

Additionally, studies will have to be completed on gas detection techniques and the associated accuracies.”

NRC Staff Response to PWR General Comment

This appears to be an initial list of items the PWROG believes should be addressed to adequately resolve the long-standing issues raised in the GL. The NRC staff believes the generic aspects of work necessary to achieve resolution is best approached by a group effort that addresses such items in one or more reports. Each addressee could then reference the reports as part of the plant-specific resolutions. This approach would be consistent with the **REQUIRED RESPONSE** Section of the GL that has been rewritten as follows:

In accordance with 10 CFR 50.54(f), an addressee must respond as described below.

Within 9 months of the date of this GL, each addressee is requested to submit a written response consistent with the requested actions and information. If an addressee cannot meet the requested response date, the addressee shall provide a response within 3 months of the date of this GL and is requested to describe the alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action

As indicated above, the information from the NRC memorandum referenced in the draft GL, ML071030382, is now provided as an updated enclosure to the GL to reflect comments the NRC staff received following publication in the *Federal Register*. A paragraph has been added to the GL enclosure to reflect the insights provided by the **PWR General Comment**.

PWR Comment 1

“The scope of the above activities suggests that a generic program approach be used. In this respect, the Generic Letter should consider the schedule for completing these activities and also add a provision for the use of interim guidance to address these issues until the generic program can be completed. The PWROG also requests that the schedule for the preparation of the TSTF associated with the Generic Letter consider the schedule for completion of the generic program to ensure that the TSTF is consistent with the guidance developed by the program.”

NRC Staff Response to PWR Comment 1

Addressees may reference generic documentation, including generic interim guidance, that has been previously provided to the NRC or they may attach generic documentation when responding to the **REQUESTED INFORMATION** and **REQUIRED RESPONSE** Sections. As discussed in the first paragraph, above, the schedule has been modified to allow more time for a generic response.

In regard to the last sentence of **PWR Comment 1**, the appropriate NRC staff members are communicating to accomplish this request. This is reflected by Hamm¹² in the following discussion that addresses TSTF scheduling:

¹²Hamm, Matthew, “Summary of March 22, 2007, Category 2 Meeting with the Technical Specifications Task Force (TSTF) to Discuss the Current Status and Administrative Process for TSTF Submissions, and Future TSTF Submissions,” NRC Memorandum to Timothy J. Kobetz,

Traveler development would involve incorporating elements of acceptable gas accumulation testing into section 5 of the Standard Technical Specifications (STS). The NRC stated the licensee response times for the GL would likely be at least six months. The TSTF stated that it may not be possible to finalize a Traveler until after licensees had time to respond to the GL. This was consistent with NRC expectations that the TSTF use the information and ideas in the GL responses in formulating the Traveler.

This is discussed further in the **NRC Staff Response to PWR Comment 9**.

PWR Comment 2

“In the first paragraph of the Discussion Section, it is stated that ‘venting processes sometimes did not ensure that all gas was removed from the venting location’. Use of the word ‘all’ conflicts with the statement that the piping should be ‘sufficiently full of water’.”

NRC Staff Response to PWR Comment 2

The rewritten **DISCUSSION** Section no longer contains this statement.

PWR Comment 3

“In the first paragraph of the Discussion Section, it is stated that the issues include Technical Specifications that ‘do not adequately address operability of the subject systems prior to surveillance and for the time span until the next surveillance.’ An evaluation of various gas intrusion mechanisms (e.g., check valve leakage, degasification in other high points due to venting at a lower elevation, operation alignments, ... etc.), as well as the potential void growth rate would be required to address the operability of the subject systems between surveillances. See General Comment #1.”

NRC Staff Response to PWR Comment 3

The NRC staff agrees with this comment. The rewritten **DISCUSSION** Section and inclusion of detail in the GL enclosure cover these topics.

PWR Comment 4

“In item (3) of the Discussion Section, it is stated that ‘In some plants, the relief valve reseating pressure is less than the existing RCS pressure, a condition that complicates recovery.’ It is not understood what is intended by this statement, since if the relief valve opens, the DHR system will not be damaged due to over-pressurization.”

NRC Staff Response to PWR Comment 4

Item (3) has been rewritten and expanded as follows to clarify the statement:

Gas accumulation can result in water hammer or a system pressure transient, particularly in pump discharge piping following a pump start, which can cause piping and component damage or failure. Gas accumulation in the DHR system has resulted in pressure transients that have caused DHR system relief valves to open. In some plants, the relief valve reseating pressure is less than the existing RCS pressure, a condition that complicates recovery. This was encountered, for example, during an event at Sequoyah where a pressure pulse resulting from gas in RHR discharge piping caused a relief valve to open and rendered both RHR trains inoperable for 6 hours because the relief valve failed to reseal.

PWR Comment 5

“In item (6)(1) of the Discussion Section, it is stated that ‘associated surveillance procedures, have not reliably precluded gas problems. Use of the word ‘precluded’ does not acknowledge that the piping only be ‘sufficiently full of water.’”

NRC Staff Response to PWR Comment 5

This is a reference to the paragraph that begins with:

A review of the operating experience has identified the following concerns, which are the focus of this GL:

- (1) TS SRs, as implemented by associated surveillance procedures, have not reliably precluded gas problems.

This list has been reorganized and rewritten to better focus on the principal concerns and to provide a foundation for the required responses. It now addresses the following 4 topics:

- (1) **Licensing Basis**
- (2) **Design**
- (3) **Testing**
- (4) **Corrective Actions**

The above Item (1) is now as follows:

The FSARs at many facilities state that the subject systems are full of water and TSs often require periodic surveillances to confirm this condition. Some plant TSs have incomplete SRs that cover only portions of the system. For example, the TSs may require verifying that ECCS discharge piping is full of water but may not include verification of the suction piping or containment spray piping despite the realistic concern that gas accumulation in suction piping may be more serious than gas accumulation in discharge piping. In addition, since the subject systems could be rendered inoperable or degraded by gas accumulation in any section of piping, the regulations require assessment of gas accumulation to establish operability. Some level of gas accumulation may not affect operability and, where justified, some portions of these systems may be excluded from testing. Hence, the current TSs and FSARs may establish an unnecessarily

restrictive standard for system operability. A realistic licensing basis should bound the volume of gas that may impact pump operability and the volume for which water-hammer-induced stress limits may be exceeded.

PWR Comment 6

“In item (6)(1) of the Discussion Section, it is stated that ‘Although the TS and FSAR at many facilities indicate that the subject systems are full of water, in practice it is not uncommon for licensees to vent some gas during periodic surveillances.’ Depending upon the type of maintenance and post maintenance testing that is performed; it would not be unexpected for gas to be vented, since the system may be open to the atmosphere (e.g., depressurized or drained to empty high points in other locations, ... etc.), which would introduce air into the system. Post maintenance venting is preventive. Additionally, if a licensee’s Tech Specs include a Surveillance to verify that the piping is full of water, venting some gas may be required to satisfy this surveillance. See General Comment #1.”

NRC Staff Response to PWR Comment 6

This is now covered in the above identified Item (1) **Licensing Basis**.

PWR Comment 7

“In item (6)(1) of the Discussion Section, it is stated that ‘Hence, the current TS and FSAR may establish a standard that may not be realistic to establish system operability. A realistic standard should bound the volume of gas that may impact pump operability and the volume for which water-hammer-induced stress limits may be exceeded.’ Clarification is needed to distinguish between water hammer and dynamic pressure pulsations in the piping downstream of the pump.”

NRC Staff Response to PWR Comment 7

The NRC staff uses “water hammer” to describe any transient pressure condition that is caused by or exacerbated by presence of a void in a system regardless of whether the pressure condition was benign or resulted in structural damage. For example, inspection reports have used the term for conditions where no damage occurred and where pipe hanger or system pressure boundary rupture were concerns. In this sense, a benign pressure pulsation due to a system void is simply a mild water hammer. The NRC staff has clarified its use by adding the following footnote in the GL at the location where “water hammer” is first used:

“Water hammer” refers to any transient pressure condition that is caused by or exacerbated by presence of a void in a system regardless of whether the pressure condition was benign or resulted in structural damage.

PWR Comment 8

“In item (6)(2) of the Discussion Section, it is stated that “Based on the as-found volume and location of gas, corrective actions beyond simply refilling a system may be necessary to provide

reasonable assurance that the affected system will remain operable until the next surveillance.’ See comment 3.”

NRC Staff Response to PWR Comment 8

This wording is now contained in the new Item (4) **Corrective Actions**, that reads as follows:

Some licensees have treated the accumulation of substantial gas quantities as an expected condition rather than a nonconforming condition and have not documented the condition even when it involved a substantial volume of gas that clearly constituted a significant condition adverse to quality. In such cases, Criterion XVI of Appendix B to 10 CFR Part 50 requires determining the cause of the condition and taking corrective action to preclude repetition. Based on the as-found volume and location of gas, corrective actions beyond simply refilling a system may be necessary to provide reasonable assurance that the affected system will remain operable until the next surveillance.

In light of the rewritten discussions in the GL, no further clarification is necessary.

PWR Comment 9

“In item (6)(3) of the Discussion Section, it is stated that ‘The NRC staff is initiating a Technical Specifications Task Force (TSTF) activity to address the recognized TS weaknesses associated with gas intrusion concerns.’ The NRC should clarify what is meant by this statement, specifically whether the TSTF activity will precede the scheduled completion of the development of a generic program as discussed in General Comment #1, or whether the TSTF activity would follow the completion of such a program.”

NRC Staff Response to PWR Comment 9

Reference to TSTF is now contained in the following paragraph at the end of the **DISCUSSION** section:

The enclosure to this GL, “Technical Considerations for Reasonably Assuring Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems Operability,” provides additional information. Addressees should consider this information when preparing responses to this GL. Furthermore, the NRC staff plans to use this information during activities that are being planned as a followup to this GL and for guidance in the Technical Specifications Task Force program to develop improved TSs.

PWR Comment 10

“In item (6)(3) of the Discussion Section, it is stated that ‘This condition must be shown to be satisfied during the time between surveillances,’ See comment 3.”

NRC Staff Response to PWR Comment 10

The rewritten **DISCUSSION** Section and inclusion of detail in the GL enclosure clarifies when operability must be satisfied.

PWR Comment 11

“In the last sentence of the last paragraph of the Discussion Section, it is stated that: ‘for guidance in the TSTF program to develop improved TSs.’ See comment 9.”

NRC Staff Response to PWR Comment 11

See the **NRC Staff Response to PWR Comment 9.**
PWR Comment 12

“In the Requested Actions it is stated: ‘to assure that gas intrusion is minimized and monitored in order to maintain system operability’. See General Comment #1.”

NRC Staff Response to PWR Comment 12

See the **NRC Staff Response to PWR Comment 1.**

PWR Comment 13

“An alternative to a Technical Specification Surveillance Requirement (SR) with a fixed frequency should be considered. For example, monthly venting for three consecutive months could be performed. If no significant gas was found, the frequency could be extended to a quarterly frequency for three performances, then a 6 month frequency, etc. Detailed analysis for how much gas is acceptable for an operable system should be performed on a case by case basis and not for systems that may not have venting problems.”

NRC Staff Response to PWR Comment 13

The PWR owners group will have the opportunity to propose such changes to the TS SR as part of TSTF activity.

PWR Comment 14

“The draft Generic Letter does not consider ALARA (As Low As Reasonably Achievable). For plants that do not perform routine ECCS venting, there will be a significant increase in routine doses. If no safety benefit is demonstrated after an initial testing program, the ALARA principle would indicate that such testing should be discontinued.”

NRC Staff Response to PWR Comment 14

The draft GL, near the end of the **DISCUSSION** Section, states that “an assessment ... that (1) acceptably eliminates other means of introducing gas, (2) establishes acceptable verification that the lines are essentially full following a condition that reduces the discharge line pressure,

and (3) establishes an operating history confirming that gas has not accumulated will be adequate justification for not conducting surveillances inside containment or at locations that constitute a hazard to personnel performing the assessment.” The NRC staff’s intent was to allow consideration of operating history as part of the basis for not performing system venting. However, if venting is necessary in high radiation zones to maintain operability, then measures should be taken to satisfy ALARA principles such as moving vent valves to low radiation areas.

This detail has been moved from the draft GL to a new GL enclosure. In response to **PWR Comment 14**, the GL enclosure now contains the following wording:

In some cases, it may not be necessary to conduct a surveillance to ensure operability. An assessment for such plants that (1) acceptably eliminates other means of introducing gas, (2) establishes acceptable verification that the lines are essentially full following a condition that reduces the discharge line pressure, and (3) establishes an operating history confirming that gas has not accumulated may be adequate justification for not conducting surveillances inside containment or at locations that constitute a hazard to personnel performing the assessment. For example, some three loop plants designed by Westinghouse maintain high pressure safety injection discharge lines at a pressure greater than the RCS operating pressure. This eliminates the potential for leakage from the accumulators or the RCS as a possible means to introduce gas into the discharge lines.

If venting from hazardous locations is necessary to maintain operability, measures such as relocating vent valves could be taken in order to address principles of keeping exposures as low as is reasonably achievable and personnel safety considerations.

STARS Comment

“The ‘Requested Information’ section in this draft generic letter is very general and may result in a large variation in the detail of responses. Therefore, it is suggested that the ‘Requested Information’ section be expanded to be more specific, similar to the approach in previous NRC generic letters.”

NRC Staff Response to STARS Comment

Several commenters raised similar concerns. In response, the NRC staff has rewritten the **DISCUSSION** Section to better focus on the principal concerns and to provide a foundation for the required responses. It now addresses the following topics:

- (1) **Licensing Basis**
- (2) **Design**
- (3) **Testing**
- (4) **Corrective Actions**

In addition, the sections describing responses have been rewritten as follows:

REQUESTED ACTIONS

The NRC requests that each addressee evaluate its ECCS, DHR system, and containment spray system licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

REQUESTED INFORMATION

The NRC requests that each addressee provide the following information: (a) A description of the results of evaluations that were performed pursuant to the above requested actions. This description should provide sufficient information to demonstrate that you are or will be in compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; (b) A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that you determined were necessary to assure compliance with these regulations; and, (c) A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

REQUIRED RESPONSE

In accordance with 10 CFR 50.54(f), an addressee must respond as described below.

Within 9 months of the date of this GL, each addressee is requested to submit a written response consistent with the requested actions and information. If an addressee cannot meet the requested response date, the addressee shall provide a response within 3 months of the date of this GL and is requested to describe the alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

TVA Comment

“TVA believes that casting the 40 events at Sequoyah mentioned in the subject *Federal Register* Notice as “waterhammer events” is misleading. In common nuclear industry use, the term waterhammer has the connotation of a large pressure transient that causes significant dynamic loads in the associated piping, subsequent pipe movement, and (in many cases) damage to the piping supports and the piping itself. The subject events at Sequoyah varied widely in magnitude and did not involve violent pipe movement. As mentioned in the draft, the events did not result in Residual Heat Removal (RHR) system inoperability. Rather, most of these events occurred when the Sequoyah RHR system was isolated. In this condition, “out gas” pockets formed within system high points and caused less significant gas bubble compressions. If the generic letter continues to reference the 40 Sequoyah events, the description of these events should be modified to provide a proper context.”

NRC Staff Response to TVA Comment

The comment applies to the GL sentence that stated “For example, at least 40 RHR water hammer events have occurred at the Sequoyah Nuclear Plant, although none of them rendered the RHR system inoperable.”

As discussed in the response to **PWR Comment 7**, the NRC staff has clarified its meaning of “water hammer” by adding a footnote in the GL. The NRC staff also notes that Sequoyah personnel identified RHR pipe movement due to water hammer in discussions with NRC inspectors, hanger damage was identified that might have been caused by water hammer, and that a pressure pulse event at Sequoyah caused a relief valve to open and rendered both RHR trains inoperable for six hours. However, the NRC staff concluded that the GL sentence was not necessary to establish that gas in the systems of concern needs to be addressed and the sentence has been deleted.

In addressing this comment, the NRC staff recognized an inconsistency in the **BACKGROUND** section. The NRC followup actions were identified in some of the gas issue examples but were omitted in others. This has been corrected by identifying followup actions in all examples.